representations of the muscular, alimentary, secretory, nervous, and reproductive systems, and an account of the sense organs. The paper is illustrated by ten double plates.—On the minute structure of the gills of *Palæmonetes varians*, by Edgar J. Allen, B.Sc. (Plate x.). It would seem that so far as the gills of this crustacean are concerned, the statement made by Haeckel and Ray Lankester, that the circulatory system of the Decapods is everywhere closed, does not hold true. It would also seem fairly certain that the masses of cells surrounding the venous channels, in which Kowalevsky found litmus deposited a few hours after its injection, exercise an excretory function. In addition to these excretory cells, a large number of glandular bodies occur in the axis of the gill, and these are of two kinds—clear and reticulate glands.

The number for November 1892 contains:—On the development of the optic nerve of vertebrates, and the choroidal fissure of embryonic life, by Richard Assheton, M.A. (Plates xi. and xii.). That the optic nerve is formed by the differentiation of the cells of the optic stalk into nerve fibres, which consequently lose connection with the inner wall of the optic cup, and piercing the outer wall, make connection with the outer face thereof, is held to be probable by such writers as Balfour, Foster, Marshall, Haddon, and others, whilst the opinion that it is formed by the growth of nerve fibres either from the retina (outer wall of the optic cup) or from the brain, along the optic stalk, but outside it and unconnected with it, is or has been held by His, Müller, Kolliker, Hertwig, Orr, and has been recently supported by Keibel, Froriep, and Cajal. Schäfer seems to be uncertain which view to take. As the result of the author's investigations in the frog and chick, he concludes that the optic stalk takes no part in the formation of the nervous parts of the organ of sight. The optic nerve is developed independently of the optic stalk, and at first entirely outside it. The great majority of the fibres forming the optic nerve arise as outgrowths from nerve cells in the retina.—On the larva of *Asterias vulgaris*, by George W. Field, M.A. (Plates xiii. to xv.).—On the development of the genital organs, ovoid gland, axial and aboral sinuses in *Amphiura squamata;* together with some remarks on Ludwig's hæmal system in this ophiurid, by E. W. MacBride, B.Sc. (Plates xvi. to xviii.). Concludes that echinoderms agree with other cœlomata in the origin of their genital cells these latter have at first an unsymmetrical position in echinoderms, and afterwards take on a radially symmetrical disposition in correspondence with the secondarily acquired radial form of the body. The origin of these cells adjacent to the stone canal suggests a comparison of the origin of the genital cells near the nephridia in many annelids, but the homology of the stone canal with a nephridium has yet to be proved.—On a new genus and species of aquatic Oligochæta belonging to the family Rhinodrilidæ, found in England by W. B. Benham, D.Sc. (Plates xix. and xx.). This new worm receives the name of *Sparganophilus tamesis;* it was found in some numbers in the mud of the Thames, adhering to the roots of *Sparganium ramosum*, near Goring; the cocoon is drawn out to a point at one end, while in the other it shows a narrow frayed end. As the home of the Rhinodrilidæ is America, the author suggests that the cocoons of this worm may have been introduced into the Thames amongst the roots of water plants, or attached to timber from the United States.

American Meteorological Journal, December.—Atmospheric electricity, earth currents, and terrestrial magnetism, by Prof. C. Abbe. The author has collected from various telegraph companies particulars about electrical storms, which illustrate the magnitude of the disturbances that frequently occur. The present electrical and magnetic observatories, which usually observe only some part of the whole series of phenomena, need to be supplemented by completely equipped establishments recording continuously the north-south, the east-west, and the zenithal-antipodal differences of potential. The ordinary records of atmospheric electricity give merely the difference of potential of the earth and a point in the atmosphere defined as the end of the water-dropping collector.—Notes on the use of automatic rain gauges, by J. E. Codman. Observations were made continuously for three years with the object of showing what difference the size of the gauges would make in the amount of rainfall collected. The largest gauge had a diameter of over 22 inches, and the smallest 2 inches. The results show that the size of the gauge made no practical difference. He also gives the results of rainfall collected in gauges erected at various heights on a mast. The result showed that a gauge at an elevation of 50 feet or less above the surface of the ground will collect the same amount as one on the ground, provided both are situated in a position not affected by counter-currents of air. This result agrees with that found by Prof. Hellmann in his experiments at Berlin.—Sunshine recorders, by Prof. C. F. Marvin. Thus far two methods only have been in general use, (1) the focussing of the rays of the sun by means of a glass sphere and obtaining a burn on the surface of a card, and (2) the photographic method, producing a trace on sensitized paper. The first method records only bright sunshine, while the latter method is more sensitive and records fainter sunshine. Prof. Marvin has improved a method first developed by D. T. Maring of the Weather Bureau, consisting in principle of a Leslie differential air thermometer, mercury being used to separate the air in the two bulbs. When properly adjusted and exposed to sunshine the lower blackened bulb becomes heated and causes the column to rise above a platinum point and close an electric circuit. The instrument, of which a drawing is given, is said to respond promptly to sunshine and shadow. The other articles are:—Late investigation of thunderstorms in Wisconsin, by W. L. Moore.—Observations on the aurora of July 16, by T. W. Harris, and Temperature sequences, by Prof. H. A. Hazen.

The articles in the *Journal of Botany* for November and December are mostly of interest to students of British botany. Mr. F. J. Hanbury adds two more to his new species of *Hieracium*, *H. britannicum* and *H. caniceps*; Mr. Bagnall describes a new species of bramble, *Rubus mercicus* from the Midland counties; and Mr. W. H. Pearson a new British liverwort, *Scapania aspera*. Mr. G. F. Scott Elliot contributes some useful hints on botanical collecting in the tropics.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, December 8, 1892.—"On the Photographic Spectra of some of the Brighter Stars." By J. Norman Lockyer, F.R.S.

The present communication consists of a discussion of 443 photographs of the spectra of 171 stars, which have been obtained at Kensington and Westgate-on-Sea during the last two years.

The chief instrument employed in this work has been a 6-inch refracting telescope in conjunction with—at different times—objective prisms of 7½° and 45° respectively.

By this method the time of exposure is short, and good definition, with large dispersion, is easily secured. The spectra thus obtained will bear enlargement up to thirty times without much sacrifice of definition.

The 30-inch reflector and slit-spectroscope at Westgate-on-Sea have also been used in the inquiry.

My object has not been so much to obtain photographs of the spectra of a large number of stars as to study in detail the spectra of comparatively few.

In the classifications of stars adopted by others from a consideration of the visual observations, only the broader differences in the spectra have been taken into account. Prof. Pickering has more recently employed a provisional classification in connection with the Henry Draper Memorial photographs of stellar spectra, but this chiefly relates to photographs taken with small dispersion. With larger dispersion it becomes necessary to deal with the presence or absence of individual lines.

In the first instance, the various stars of which the spectra have been photographed at Kensington have been arranged in tables, without reference to any of the existing classifications, and taking into account the finer details. The basis on which the main tabular divisions of the spectra are founded is the amount of continuous absorption at the blue end. This distinction was not possible in the case of the eye observations.

The stars included in the first table are characterized by the absence of any remarkable continuous absorption at the blue end, and by the presence in their spectra of broad lines of hydrogen. These have been further classified in four sub-divisions, depending on the presence or absence of other lines.

In the stars of the second table there is a considerable amount of continuous absorption in the ultra-violet, and the spectra beyond K are very difficult to photograph as compared with the stars of the first table. In these stars the thickness of the hydrogen lines is about the same as in the solar spectrum. These also are arranged in two sub-divisions.

In all the stars included in the third table there is a very considerable amount of continuous absorption in the violet, extending to about G, and it is a matter of great difficulty to photograph these spectra, as most of the stars of this class are below the third magnitude. The hydrogen lines are very thin. One subdivision includes the spectra which show flutings shading away towards the less refrangible end of the spectrum. The other comprises stars without flutings in their spectra. The brightest star in this table, α Orionis, is discussed in detail, the result tending to show that the temperature of the absorbing iron vapours is not much greater than that of the oxy-hydrogen flame.

The relations of the various sub-divisions to which reference has been made are then traced.

One important fact comes out very clearly, namely, that whether we take the varying thicknesses of the hydrogen lines or of the lines of other substances as the basis for the arrangement of the spectra, it is not possible to place all the stars in one line of temperature. Thus, there are stars in which the hydrogen lines are of the same average thickness, while the remaining lines are almost entirely different. These spectra cannot, therefore, be placed in juxtaposition, and it is necessary to arrange the stars in two series.

The next part of the paper consists of a discussion of the photographic results in relation to the meteoritic hypothesis. In the Bakerian Lecture for 1888, I brought together the various observations of the spectra of stars, comets, and nebulæ, and the discussion suggested the hypothesis that all celestial bodies are, or have been, swarms of meteorites, the difference between them being due to different stages of condensation. The new classification rendered necessary by this hypothesis differed from previous ones, inasmuch as the line of evolution followed, instead of locating the highest temperature at its commencement, as demanded by Laplace's hypothesis, placed it much later. Hence bodies of increasing temperature were demanded as well as bodies of decreasing temperature.

The question how far this condition is satisfied by the new facts revealed by the photographs is next discussed.

This involves the consideration of some points in connection with the hypothesis to which brief reference alone has been made in previous communications. The phenomena to be expected on the hypothesis, and the actual facts, are given side by side below:—

Nebulæ.

The bright lines seen in nebulæ should have three origins:—	
(1) The lines of those substances which occupy the interspaces between the meteorites. Chief among these, from laboratory experiments, we should expect hydrogen and gaseous compounds of carbon.	(1) Lines at wave-lengths approximately very closely to the lines of hydrogen, and to some of the carbon flutings, appear in the spectra of nebulæ.
(2) The most numerous collisions between the meteorites will be partial ones—mere grazes—sufficient only to produce comparatively slight rises of temperature.	(2) There is a fluting most probably due to magnesium at λ 500, and the longest flame lines of iron, calcium, and magnesium are seen.
(3) There will, no doubt, be a small number of end-on collisions, producing very high temperatures, and there should be evidence of some high-temperature lines.	(3) The chromospheric line D_3 and another line at λ 4471 (which is always associated with D_3 in the chromosphere) have been recorded in the spectrum of the Orion Nebula.

Bright-Line Stars.

The lines seen in the spectra of bright-line stars should, in the main, resemble those which appear in nebulæ. They will differ, however, for two reasons given in the paper.	Prof. Pickering has shown that the Draper Memorial photographs prove that bright-line stars are intimately connected with the planetary nebulæ, the lines in the spectra being almost identical.

Stars of Increasing Temperature.

Stage 1.—Immediately following the stage of condensation giving bright-line stars, the bright lines from the interspaces will be masked by corresponding dark ones, due to absorption of the same vapours surrounding the incandescent meteorites, and these lines will therefore vanish from the spectrum.	The spectra of stars given in the third table answer these requirements. They show no bright lines under normal conditions.
Owing to the interspaces being restricted, absorption phenomena will be in excess, and low-temperature metallic fluting absorption will first appear. The radiation spectrum of the interspaces will now consist chiefly of carbon.	The dark flutings in the visual spectrum agree very closely in position with the flutings seen in the flame spectra of manganese, lead, and iron. The evidence afforded by the photographs proves the actual presence of carbon radiation.
Under these conditions the amount of continuous absorption at the blue end will be at a maximum.	The photographs show a considerable amount of continuous absorption in the ultra-violet and violet.
Stage 2.—With further condensation, the radiation spectrum of the interspaces will gradually disappear, and dark lines replace the fluting absorption owing to increase of temperature, though this line absorption need not necessarily resemble that in the solar spectrum.	The spectra consist of numerous dark metallic lines, but they do not exactly resemble the solar spectrum. α Tauri and γ Cygni are types of stars at this stage.
Stage 3.—(1) The line absorption and the continuous spectrum at the blue end will diminish as the condensations are reduced in number, as only those vapours high up in the atmospheres surrounding the condensations will be competent to show absorption phenomena in consequence of the bright continuous spectrum of the still disturbed lower levels of those atmospheres.	(1) These conditions are satisfied by such stars as α Cygni, Rigel, Bellatrix, δ Orionis, and α Virginis. In these there is no continuous absorption at the blue end, the spectra consisting of simple line absorption.
(2) Lines of iron and other substances will disappear at this stage, because the bright lines from the interspaces will counteract the lines in the same positions due to absorption of surrounding vapours.	(2) In the spectrum of α Cygni, which represents the earliest example of this stage, there are a few of the longest lines of iron, but in other stars of this class the iron lines disappear.
(3) The chances of violent collisions being now enormously increased, we should expect the absorption of very high-temperature vapours. The solar chromospheric lines may be taken as examples of lines produced at such temperatures.	(3) The new lines which appear include the chromospheric line at λ 4471, and possibly a few others.

The Hottest Stars.

The order of the absorbing layers should follow the original order of the extension of the vapours round the meteorites in the first condition of the swarm, and the lines seen bright in nebulæ, whatever their origins may be, should therefore appear almost alone as dark lines.	In stars like α Andromedæ we have absorption lines agreeing in position with some of the bright lines which appear in nebulæ.

Stars of Decreasing Temperature.

Stage 1.—Owing to the diminishing depth of the absorbing atmosphere, the hydrogen lines will, on the whole, get thinner, and new lines will appear. These new lines will not necessarily be identical with those observed in the spectra of stars of increasing temperature. In the latter there will be the perpetual explosions of the meteorites affecting the atmospheres, whereas in a cooling mass of vapour we get the absorption of the highest layers of vapours. The first lines to appear, however, will be the longest low-temperature lines of the various chemical elements.	Taking Sirius as a type of stars in the first stage of decreasing temperature, it is found that its spectrum shows many of the longest lines of iron.
Stage 2.—The hydrogen lines will continue to thin out, and the spectra will show many more of the high-temperature lines of different elements. These will differ from the lines seen in stars of increasing temperature owing to the different percentage composition of the absorbing layers, so far as the known lines are concerned.	The conditions at this stage of cooling are satisfied by such stars as β Arietis and α Persei. In the spectrum of these stars nearly all the solar lines are found, in addition to fairly broad lines of hydrogen.
Stage 3.—With the further thinning out of the hydrogen lines and reduction of temperature of the atmosphere, the absorption flutings of the compounds of carbon should come in.	There is undoubted evidence of the presence of carbon absorption in the solar spectrum and the spectrum of Arcturus, the only star which has yet been investigated with special reference to this point.

The photographs, then, give us the same results as the one formerly obtained from the eye observations.

Comparison is then made between the groups in the classification first suggested by the eye observations, and the various sub-divisions in which the photographs have been arranged.

Geological Society, December 7.—W. H. Hudleston, F.R.S., President, in the chair.—The following communications were read :—Note on the Nufenen-stock (Lepontine Alps), by Prof. T. G. Bonney, F.R.S. In 1889 the author was obliged to leave some work incomplete in this rather out-of-the-way portion of the Lepontine Alps. In the summer of 1891 he returned thither in company with Mr. J. Eccles, F.G.S., and the present note is supplementary to the former paper. The Nufenen-stock was traversed from north to south, and a return section made roughly along the eastern bank of the Gries Glacier. Gneiss abounds on the north side of the Nufenen Pass, followed by rauchwacké and some Jurassic rock. On the flank of the mountain are small outcrops of rauchwacké and of the so-called "Disthene-schists" (both badly exposed), followed by much Dark-mica schist, often containing black garnets. Higher up is a considerable mass of Jurassic rock with the "knots" and "prisms" which have been mistaken for garnets and staurolites, but Dark-mica schists set in again before the summit is reached. They continue down the southern flank of the peak : but rather north of the lowest part of the water-shed, between Switzerland and Italy, the "Disthene-schist" is again found, followed by a fair-sized mass of rauchwacké. The return section gave a similar association in reverse order; and both confirmed the conclusions expressed by the author in 1890 as to the absence of garnets and staurolites from Jurassic rocks (with belemnites, &c.), and the great break between these or the underlying rauchwacké (where it occurs) and the crystalline schists, in which garnets often abound, of the Lepontine Alps The crystalline schists and the Mesozoic rocks are thrown into a series of very sharp folds, which, locally, presents at first sight the appearance of interstratification.—On some schistose "greenstones" and allied hornblendic schists from the Pennine Alps, as illustrative of the effects of pressure-metamorphism, by Prof. T. G. Bonney. The author describes the results of study in the field, and with the microscope, of (*a*) some thin dykes in the calc-schist group, much modified by pressure ; (*b*) some larger masses of green schist which appear to be closely associated with the dykes ; (*c*) some other pressure-modified greenstone dykes of greater thickness than the first. The specimens were obtained, for the most part, either near Saas Fee or in the Binnenthal. These results, in his opinion, justified the following conclusions :—(1) That basic intrusive rocks, presumably once dolerites or basalts, can be converted into foliated, possibly even slightly banded, schists, in which no recognizable trace of the original structure remains. (2) That in an early (possibly the first) stage of the process, the primary constituents of the rock-mass are crushed or sheared, and thus their fragments frequently assume a somewhat "streaky" order ; that is to say, the rock passes more or less into the "mylonitic" condition. (3) That next (probably owing to the action of water under great pressure) certain of the constituents are decomposed or dissolved. (4) That, in consequence of this, when the pressure is sufficiently diminished, a new group of minerals is formed (though in some cases original fragments may serve as nuclei) (5) That of the more important constituents hornblende is the first to form, closely followed, if not accompanied, by epidote ; next comes biotite (the growth of which often suggests that by this time the pressure is ceasing to be definite in direction) ; and, lastly, a water-clear mineral, probably a felspar, perhaps sometimes quartz. (6) That in all these cases the hornblende occurs either in very elongated prisms or in actual needles. The author brings forward a number of other instances to show that this form of hornblende may be regarded as indicative of dynamometamorphism ; so that rocks where that mineral is more granular in shape (cases where actinolite or tremolite appears as a mere fringe being excepted) have not been subjected to this process.—On a secondary development of biotite and of hornblende in crystalline schists from the Binnenthal, by Prof. T. G. Bonney. Both the rocks described in this communication come from the Binnenthal, and were obtained by Mr. J. Eccles, F.G.S., in the summer of 1891. They belong to the Dark-mica schists described by the author in former papers, and have been greatly affected by pressure. In each a mineral above the usual size has been subsequently developed. In the rock from near Binn this mineral is a biotite : the dimensions of one crystal, irregular in outline, and having its basal cleavage roughly perpendicular to the lines indicative of pressure, are about ·175″ × ·03″. The other mineral, from the peak of the Hohsandhorn, is a rather irregularly-formed hornblende, the crystals (which lie in various directions) being sometimes more than half an inch long. The exterior often is closely associated with little flakes of biotite. The author discusses the bearing of this fact, and the circumstances which may have favoured the formation of minerals, so far as his experience goes, of an exceptional size. Some remarks also are made on relation of these structures developed in the Alpine schists to the various movements by which those rocks have been affected, and on the general question of pressure as an agent of metamorphism. The reading of these papers was followed by a discussion, in which the President, Mr. Eccles, the Rev. E. Hill, Mr. Rutley, Mr. Teall, and the author, took part.—Geological notes on the Bridgewater District in Eastern Ontario, by J. H. Collins.

PARIS.

Academy of Sciences, January 2.—M. d'Abbadie in the chair.—M. Lœwy was elected Vice-President for 1893. MM. Fizeau and Fremy were elected into the central committee of administration. The President gave a list of the members, associates, and correspondents deceased and elected during 1892. The new members were MM. Appell, Perrier, Guyon, and Brouardel. Foreign associates, MM. von Helmholtz, and van Beneden. Correspondents, MM. Sophus Lie, Considère, Amsler, Auwers, Rayet, Perrotin, de Tillo, and Manen.—Observations of Brooks's comet (November 19, 1892) made with the *equatorial coudé* of the Lyon Observatory, by M. G. Le Cadet.—On a new method of approximation, by M. E. Jablonski.—On the movements of systems whose trajectories admit of an infinitesimal transformation, by M. Paul Painlevé.—On the general form of vibratory motion in an isotropic medium, by M. E. Mercadier.—On thermo-electric phenomena between two electrolytes, by M. Henri Bagard. The thermo-electric force between two portions of the same electrolyte in different stages of dilution was determined by experiments performed at the physical laboratory of the Faculty of Sciences at Nancy. The diaphragm employed consisted of goldbeater's skin, which has the advantage of closely adhering to the glass. The results are given in the case of zinc sulphate. With a 5 per cent. and a 45 per cent. solution the difference of potential ranged from 78 at 17·9° to 155 at 73·5°, the unit being 1/10000th of the E.M.F. of a Daniell cell. The law of intermediate bodies was strictly fulfilled, as shown by opposing a couple of 5 and 25 per cent. in series with another of 25 and 45 per cent. to a third of 5 and 45 per cent., when no deflection of the electrometer was observed between 0° and 73·3°.—On the age of the most ancient eruptions of Etna, by M. Wallerant. The first eruptions of Etna have been variously estimated to have occurred in the later quaternary or in the upper pliocene periods. These conclusions were based on the study of the prismatic basalt laid bare by the sea round the foot of the cone. The pliocene deposits found in conjunction with part of the basalt appear from palæontological evidence to be contemporaneous with the sub-Appenine blue marls, which belong to the lower pliocene. In the Cyclopean Isles the basalt is covered with a layer of clay, which is also found interpenetrated by the basalt. The identity of age of the two formations is evidenced by lenticular patches of sand interstratified in the clay, whose particles consist of fragments of pyroxene, peridote, and triclinic felspar, proving that when the sub-Apennine marls were being deposited Etna was the scene of eruptions accompanied by the emission of ashes.

DIARY OF SOCIETIES.

LONDON.

THURSDAY, JANUARY 12.

Mathematical Society, at 8.—On the Application of Clifford's Graphs to Ordinary Binary Quantics, 2nd Part, Seminvariants: The President.—On the Evaluation of a Certain Surface-integral and its Application to the Expansion of the Potential of Ellipsoids in Series: Dr. Hobson,

Society of Arts, at 4.30.—Upper Burma under British Rule: H. Thirkell White.

Institution of Electrical Engineersf at 8.—Experimental Researches on Alternate-Current Transformers: Prof. J. A. Fleming, F.R.S. (Discussion.)

London Institution, at 6.—Electric Lighting (1) Generation of Electric Currents: Prof. Silvanus Thompson, F.R.S.

FRIDAY, JANUARY 13.

Physical Society, at 5.—Upon Science Teaching: F. W. Sanderson.

Society of Arts, at 8.—The Development and Transmission of Power from Central Stations: Prof. W. Cawthorne Unwin, F.R.S.

Institution of Civil Engineers, at 7.30.—Description of the Design and Construction of a Roadway Bridge over the River Cam: Edwin Hulme.

Amateur Scientific Society, at 8.—Geology in 1892: A. M. Davies.—Recent Developments in the Metallurgy of Gold: T. K. Rose.

SATURDAY, JANUARY 14.

Royal Botanic Society, at 3.45.

SUNDAY, JANUARY 15.

Sunday Lecture Society, at 4.—Some Invasions of India and their Results" (with Oxyhydrogen Lantern Illustrations): R. W. Frazer.

MONDAY, JANUARY 16.

Royal Geographical Society, at 8.30 (at the University of London, Burlington Gardens, W.)—Journeys in Sarawak, Borneo (Illustrated by the Oxy-hydrogen Lantern): Charles Hose.

Victoria Institute, at 8.—Why the Ocean is Salt: Prof. Hull, F.R.S.

London Institution, at 5.—The Spanish Armada (Illustrated): F. L. S. Horsburgh.

TUESDAY, JANUARY 17.

Zoological Society, at 8.30.—A Proposed Classification of the Hesperiidæ, with a Revision of the Genera: E. Y. Watson.—Descriptions of New Species of Dipterous Insects of the Family Syrphidæ in the Collection of the British Museum, with Notes on the Species described by the late Francis Walker: E. E. Austen.—On Two New Species of Copepoda from Zanzibar: Gilbert C. Bourne.

Mineralogical Society, at 8.—On a Discovery of Oriental Ruby and Margarite in the Province of Westland, New Zealand: Prof. G. H. F. Ulrich.—On the Isomorphism of the Red Silvers: H. A. Miers.—On the Occurrence of Baddeleyite (Native Zirconia) in Brazil: L. Fletcher, F.R.S.

Royal Statistical Society, at 7.45.—The Reorganization of our Labour Department: David F. Schloss.

Institution of Civil Engineers, at 8.—Gas Power for Electric Lighting: J. Emerson Dowson. (Discussion.)—Reception by the President and Council.

Royal Institution, at 3.—The Functions of the Cerebellum, and the Elementary Principles of Psycho-Physiology: Prof. Victor Horsley F.R.S.

WEDNESDAY, JANUARY 18.

Royal Meteorological Society, at 7.15.—Annual Meeting.—The High Altitudes of Colorado and their Climates: Dr. C. Theodore Williams.

Royal Microscopical Society, at 8.—Annual Meeting.—Presidential Address: Dr. R. Braithwaite.

Entomological Society, at 7.—Election of Council and Officers for 1893: Report of the Council, and Address by the President, F. D. Godman, F.R.S.

THURSDAY, JANUARY 19.

Royal **Society**, at 4.30.—The Bakerian Lecture: The Rate of Explosion in Gases: Prof. H. B. Dixon, F.R.S.

Linnean Society, at 8.—The Plants of Malanji, collected by Mr. A. Whyte, and described by Messrs. Britten, Baker, and Rendle: W. Carruthers, F.R.S.—Report on the District traversed by the Anglo-French Sierra Leone Boundary Commission: G. F. Scott Elliot.

Chemical **Society**, at 8.—The Determination of the Thermal Expansion of Liquids: Prof. T. E. Thorpe, F.R.S.—The Thermal Expansion and Specific Volumes of Certain Paraffins and Paraffin Derivatives: Prof. Thorpe, F.R.S., and Lionel M. Jones.—The Hydrocarbons formed by Decomposition of the Citrine Dihydrochlorides: W. A. Tilden, F.R.S., and Sidney Williamson.—Camphorsulphonic Derivatives: F. S. Kipping and W. J. Pope.—Note on the Decaphanes formed from Terpenes and Camphor: Henry E. Armstrong.

Institution of Civil Engineers, at 2.30.—Students' Visit to the Works of Messrs. Maudslay, Sons, and Field, Westminster Bridge Road, S.E.

Royal Institution, at 3.—Tennyson: Rev. Canon Ainger.

London Institution, at 6.—Electric Lighting (2) Electric Lamps: Prof. Silvanus Thompson, F.R.S.

FRIDAY, JANUARY 20.

Royal Institution, at 9.—Liquid Atmospheric Air: Prof. Dewar, F.R.S.

SATURDAY, JANUARY 21.

Royal Institution, at 3.—Expression and Design in Music (with Musical Illustrations): Prof. C. Hubert H. Parry.

CONTENTS.

PAGE
American Mechanism 241
Seedlings. By **Dr. Maxwell T. Masters, F.R.S.** . . . 243
Epidemic Influenza 244
Our Book Shelf:—
  Wakefield: "An Elementary Text-book of Hygiene" 245
  "Ostwald's Klassiker der Exakten Wissenschaften" 245
Letters to the Editor:—
  Geographical Names.—**Colonel H. H. Godwin-Austen, F.R.S.** 245
  The Weather of Summer. (*With Diagram.*)—**A. B. M.** 245
  "Aminol."—**Hugo Wollheim; Dr. E. Klein, F.R.S.** 246
  Super-abundant Rain.—**Sir H. Collett** 247
  Earthquake Shocks.—**E. J. Lowe, F.R.S.** 247
  A Brilliant Meteor.—**W. Pollard** 247
Chemical Society's Memorial Lectures 248
Extinct Monsters. (*Illustrated.*) By **H. G. S.** . . . 250
Energy and Vision 252
Notes 252
Our Astronomical Column:—
  The Motion of Nova Aurigæ 256
  Astronomical Discoveries in 1892 256
  Comet Holmes 256
  Ephemeris of Comet Brooks (November 20, 1892) . . 257
  The Meteor Shower of November 23, 1892 257
Geographical Notes 257
A New Seismograph. By **Dr. H. J. Johnston-Lavis** 257
Physical Geography and Climate of New South Wales. By **H. C. Russell, F.R.S.** 258
Scientific Serials 260
Societies and Academies 261
Diary of Societies 264